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ED 016 475 JC 670 985

THE MACRO-PROGRAMMED CURRICULUM FINAL REPORT.

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EDRS PRICE MF-$0.50 HC-$3.56 87P.

DESCRIPTORS- *JUNIOR COLLEGES, *ACCELERATED PROGRAMS, *EXPERIMENTAL PROGRAMS, *ENGINEERING EDUCATION, *TEACHER EDUCATION, INSTRUCTIONAL INNOVATION, CURRICULUM DEVELOPMENT, COURSE ORGANIZATION,

THIS PROGRAM WAS DESIGNED TO ALLOW ABLE STUDENTS TO ACCELERATE THEIR PACE AND PERMIT OTHERS TO PROCEED AT THEIR OWN RATE. EACH SEMESTER WAS DIVIDED INTO THREE FIVE-WEEK SESSIONS, EACH SESSION PRESENTING A FULL SEMESTER'S COURSE. TO ACCOMPLISH THIS, THE INSTRUCTOR GAVE ONLY EVERY THIRD LECTURE OF THE FULL SEMESTER'S 45-CLASS SCHEDULE. IF THE STUDENT SUCCEEDED ON THIS PROGRAM OF ONE THIRD OF THE LECTURES PLUS OUTSIDE PREPARATION AND STUDY, HE WAS ALLOWED TO PROCEED TO A NEW AREA OF STUDY. IF HE DID NOT SUCCEED, HE TOOK THE NEXT FIVE-WEEK SESSION WITH ANOTHER THIRD OF THE LECTURES, AND, IF NECESSARY, THE THIRD SESSION. THE PROGRAM WAS TESTED ON EDUCATION STUDENTS IN METHODS OF TEACHING THREE ELEMENTARY SUBJECTS, AND ON CIVIL ENGINEERING STUDENTS IN THREE COURSES. OF THE 228 STUDENTS INVOLVED, 55.7 PERCENT OF THOSE IN EDUCATION AND 35.6 IN ENGINEERING COMPLETED THE COURSE IN LESS THAN 15 WEEKS. AFTER EXAMINING THEIR ATTITUDES AND ACHIEVEMENT, THE RESEARCHERS FOUND THAT (1) FOR ALL STUDENTS, THE PROGRAM OFFERED THE POSSIBILITY OF ACCELERATION AND INCREASED FLEXIBILITY, BUT SUFFERED FROM PRESSURE OF TIME, (2) FOR THE EDUCATION STUDENTS, IT ALSO OFFERED AN INTRODUCTORY OVERVIEW, BUT SHOWED INCONSISTENT PROCEDURES AMONG THE INSTRUCTORS, AND (3) FOR THE ENGINEERS, IT GAVE A CHANCE FOR MORE STUDENT INITIATIVE, BUT LACKED CONSISTENT GRADING PRACTICES. FOUR RECOMMENDATIONS FOR THE IMPROVEMENT AND USE OF THE MACRO-PROGRAM ARE GIVEN. (HH)

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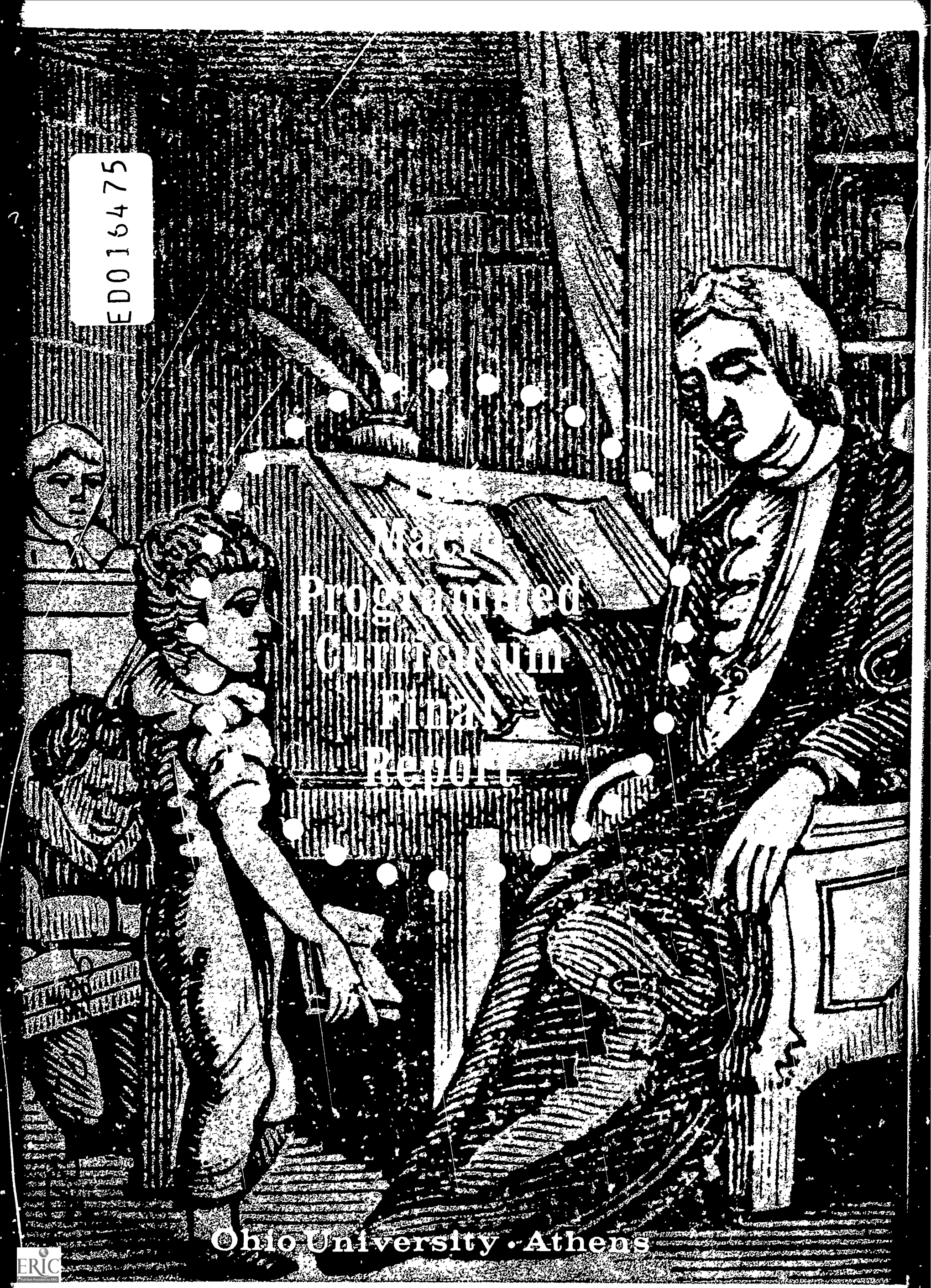
Math Programmed Curriculum Final Report



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The Macro Programmed Curriculum*

Final Report

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JC 670 985

*Supported entirely by a grant from the Esso Education Foundation, New York, New York.

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Acknowledgments

The writers of this report would like to acknowledge the support and cooperation exhibited by all of the staff members listed on the following page. This was especially appreciated when the attitude data were being collected, and, in the final preparation of the report when course summaries and evaluations were requested.

Although not a member of the actual staff who participated in the program, Dr. Paul B. Koons deserves special recognition for his willing help in analyzing portions of the data. He not only supervised the preparation of the data for computer analysis, but, actually took time to re-write and modify existing programs to suit better the specific needs of this project. This he did willingly and without remuneration.

Sincere thanks to the Esso Education Foundation, New York, New York, without whose financial support this experiment would never have occurred.

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General Summary

Basic Objective of the Program:

The basic objective of the Macro-Programmed Curriculum was to provide able students with the opportunity to accelerate the pace of their college education without requiring significant increase in equipment, space, and faculty tutorial time. At the same time, the program was designed to be sufficiently flexible so that the average and below average students could participate, but at a rate equal to their abilities.

General Summary of the Program:

Under the Macro program, each of two semesters was divided into three five week sessions. During these five week periods, a full semester's length course was presented.

For each of the six Macro-Programmed courses offered each semester, the professor prepared lesson plans and outlines which detailed the lectures given in the forty-five class periods normally held. In addition, any outside materials considered by the instructor during a usual semester were also outlined.

Under the Macro Program, the professor actually delivered only fifteen lectures during each five week session. At the successive class meetings during the first five weeks, he gave what would normally have been the first, fourth, seventh, etc. lectures. The student was required to research and organize the material presented in the thirty lectures which were omitted. At the end of the five week period, students were examined and those who passed the course were

permitted to move on to a new area of study. Those who did not demonstrate sufficient knowledge of the material at the end of five weeks were required to repeat the course during the following five week session.

During the second five week term, the professor delivered the second, fifth, eighth, etc. lectures of the series. Students enrolled in the second five week session included those who had successfully completed other Macro programmed courses and those who had not met the present course requirements during the first five weeks. For those who were repeating, the second five weeks provided an opportunity to review the material assigned previously and also permitted them to receive an additional fifteen lectures. Again, examinations determined whether a student had adequately mastered the material. If he passed, he could move on to another course, but if he failed to meet the instructor's requirements, he re-enrolled in the same course for the third five week portion of the semester.

During the third term, the professor delivered the third, sixth, ninth, etc. lectures of the regular semester series. As during the second five weeks, the class was made up of students entering from other courses and those who were repeating from the second five weeks. For the student who was repeating the course a third time, this offered him an opportunity to again go over the material and at the end of the final session, he had received all of the lectures normally given during a regular semester, but obviously, in a

different sequence than those taught in the usual manner. Thus, other than the inconvenience of receiving the forty-five lectures in a staggered sequence, the student who repeated three times received exactly the same lectures and spent as much time in class as the student enrolled in the regular semester long course.

Regular Courses

15-week semester; regular presentations of 45 lectures. Grade given at the end of the semester.

Macro Courses

First Five Weeks	Second Five Weeks	Third Five Weeks
Lectures 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, and 43 given; at the end of 5 weeks, grades are given and the student may remain for another five weeks or move on to another Macro course; if he elects to move on this becomes his final grade.	Again, full course coverage; repeat of previous five weeks, except that lectures 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, and 44 given; grades again given and the student may elect to stay or move on; whether a final grade is recorded depends on his decision.	Full course coverage for the third time; lectures 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, and 45 given; grades again given; for students who stayed in the same course for all three segments, this represents the grade which will be recorded.

Experimental Design and Evaluation Procedures:

The overall effectiveness of the program was evaluated in terms of two basic types of criterion measures. First, a comparison of the academic achievement of the students in the Macro Program was made with the achievement of students taught in the regular semester length course. To control for varying effectiveness of teachers, each

instructor taught a Macro section and the regular semester length course which served as the control group. Achievement was measured in both conditions by use of the same examinations where possible. To prevent practice effects which would have favored Macro program students who had to repeat a five week session, alternate exams were devised and used.

Second, the attitudes of the students toward the program were also evaluated. To permit a direct comparison between reactions of the Macro program students and those taught in the usual fashion, an extensive questionnaire was given each student in both groups. This information was supplemented by in-depth interviews with some students.

While it was assumed that success in the Macro-Program would very likely be related to general academic ability, the influence of personality factors such as social maturity, need achievement, etc. were also recognized as being potentially important. To determine the relevance of these variables, the California Personality Inventory was administered and the scores on the various sub-scales were also considered in relation to the student's success in the program.

Although major interest of the experiment was in the reactions of the students to the Macro program, faculty reactions were also given extensive consideration. Questionnaires, in-depth interviews, and conferences were used to determine faculty views concerning the overall merit of the program.

Specific Summaries of the Courses

I. Education

The three courses used for the Macro Program were all related to methods of teaching in elementary school: Language Arts, Arithmetic, and Social Studies-Science. The general purpose of these courses was to prepare students for student teaching in the basic content areas of the elementary school. For all courses the pre-requisites included junior standing and admission to teacher education. During the semester (or five week Macro periods) students in all of the courses prepared units suitable for use in the elementary class, planned projects using content materials, presented lessons to class-mates, and observed teaching on closed-circuit television.

Education 163: Teaching the Language Arts in the Elementary School: Students in this course were expected to have an awareness of the nature of language and proficiency in both reading and written expression. Specific prerequisites in addition to those listed above included having passed the English and speech proficiency tests. The purpose of the course was to provide a basic groundwork to prepare the student to teach all aspects of oral communication, reading, handwriting, spelling, and written communication. The primary method of teaching was lecture-discussion with supplementary TV and instructional films used to provide examples. All students prepared projects appropriate for use in elementary language arts classes.

The Macro and regular sections were handled in basically the same manner, except for the following: Regular sections had three hourly tests in addition to the final, while the Macro sections had only one test at the end of each five week phase. 2) Students in regular sections prepared 23 outside projects and assignments, the Macro students did 13 for each phase. As stated initially, however, testing and grading were made as comparable as possible.

Education 165: Teaching Arithmetic in the Elementary School: Students in this course were expected to have a good basic knowledge of mathematics and to have passed the basic mathematics course (Math 8) offered by the Mathematics department. The purpose of the course was to prepare the student to teach topics such as number systems, number manipulation, measurement, and geometry at the elementary level. Lecture was the primary method of teaching in both the regular and Macro sections. Grades in both groups were based on tests. The only real difference was in the number of tests given. The Macro students received only one per five weeks while regular students were given during the semester several hourly tests in addition to the final examination.

Education 169: Teaching of Science - Social Studies in the Elementary School: Students in this course were required to have completed nine hours of laboratory science plus nine hours of social science including, specifically, a sophomore level geography course. The basic purpose of the course was to present students with various

techniques and methods for teaching science to elementary children. Special emphasis was placed on teaching techniques, selection and use of textbooks, and the selection and use of scientific equipment and visual aids. The primary method of teaching was lecture combined with demonstrations of various types of equipment. Considerable emphasis was placed on giving students the opportunity to perform in front of a group. In both the regular and Macro sections, grades were based on three tests plus evaluation of the students' demonstration teaching and the adequacy of their lesson plan preparation.

II. Engineering

The three engineering courses used for the Macro Program were basic ones required of all Civil Engineering students. In addition to being basic courses, the three were also part of a sequence so that knowledge gained on one course was needed for adequate performance in the other two. The general purpose of these courses was to provide students with a good basic understanding of the laws of mechanics as they are used and applied by the civil engineer. For two of the courses, the prerequisites included sophomore standing, for the third, junior standing. In all three, a good background in mathematics was required.

Civil Engineering 120: Statics: Almost all students in this course were sophomores and were assumed to have a good general knowledge of integral calculus. The basic purpose of the course was to provide students with an understanding of the laws of mechanics as applied to static force systems. Special emphasis was placed on the

study of equilibrium of force systems, friction, centroids and moments of inertia. Teaching methods were basically the same for the Macro and regular sections and both were taught by lecture and problem solving. Grading was based entirely on test performance: four, one-hour tests and a two hour final were given in the regular sections while the Macro groups received one two-hour midterm and a two-hour final for each five week session.

Civil Engineering 121: Dynamics: Students in this course were expected to have a good basic knowledge of mathematics through advanced calculus and to have taken Civil Engineering 120 (another course in the Macro Program). The basic purpose of the course was to develop an understanding of kinetics with respect to translation, rotation, and plane motion. Special emphasis was placed dealing effectively with time displacement relationships relative to both fixed and moving points. Newton's basic law dealing with force, mass and acceleration was considered in detail with emphasis placed on the study of work and energy, impulse, momentum, impact, and conservation of momentum. An introduction to vibration was also studied.

The teaching method in both the regular and Macro sections involved lecture and discussion. The only real difference in the Macro and regular sections was in the number of examinations given. Students in the regular sections was in the number of examinations given. Students in the regular section had four one-hour exams plus a two-

hour final. Those in the Macro section had a three-hour final only. These exams were the only basis for grading.

Civil Engineering 222: Strength of Materials: Students enrolled in this class were typically of junior standing and had to possess a good background in engineering physics and math through advanced calculus. In addition, Civil Engineering 120, another of the Macro Series was also required. The basic purpose of the course was to give the student an understanding of the mechanical properties and behavior of engineering materials. The major topics considered were theories of failure, unsymmetrical bending, shear center and, in general, the behavior of engineering materials under various conditions and types of load.

The method of teaching in both the Macro and regular sections was basically the same, lecture and discussion. Grades were based primarily on tests but daily assignments were required of students in both sections. The students in the regular section were given four hourly exams and a two-hour final while those in the Macro section were given a two-hour mid-term and a final during each five week session.

TABLE I

Percent of Students Who Accelerated in Each Course

Course	Semester	Number Enrolled	Number Completed at 5 weeks	Number Completed at 10 weeks	Percent Accelerated
Education 163	1	31	6	6	38.7
163	2	19	0	1	52.6
Education 165	1	25	12	9	84.
165	2	18	6	5	61.
Education 169	1	9	6	1	77.7
169	2	11	6	5	100.
Education Total:		113	36(31.8%)	27(23.9%)	55.7
Civil Engineering 120	1	25	2	3	20.
120	2	23	4	5	39.1
Civil Engineering 121	1	10	0	2	20.
121	2	13	2	1	23.
Civil Engineering 222	1	23	4	7	47.8
222	2	21	4	7	52.3
Engineering Total:		115	16(13.9%)	25(21.7%)	35.6
TOTALS:		228	52(22.8%)	52(22.8%)	45.6

RESULTS

The experiment was very successful in demonstrating the ability of students in these six courses to set their own paces. Of the 228 students involved 45.6% completed a course in less than the normal 15 weeks; 52 completed a course in 5 weeks and 52 more in 10 weeks. In the Education courses 55.7% of the students accelerated their programs and in the Engineering courses 35.6% of the students accelerated. The results for each course and totals are shown in Table I.

In the following section, the academic achievements and attitudes of the students in the Macro and regular sections will be reported separately for the first and second semesters. In addition to comparing the grades earned by the students in the two sections, the number of Macro students who completed the entire course in less than fifteen weeks will also be reported since this measure probably gives the most accurate indication of the degree to which the Macro program achieved its objective of permitting students to accelerate their academic progress.

For both of the semesters, attitude measures will be reported by comparing the Macro and regular students' answers to the same questions on the general questionnaire (see Fig. 1). These attitudes are summarized in Tables III through XII. The comparisons and computations of differences are based on the mean of the measures

taken at the end of each of the three Macro cycles and the mean of the control group which was given the questionnaire at the end of the fifteen week semester. In all instances, ratings were made on a five point scale which was scored 0 through 4 with the mid point at 2. A positive value in the comparison of the means indicates that the Macro group was rated higher, a negative value indicates superiority of the control group.

Fig. 1 Student Rating Scale

Used for all Groups --- Objective Questions Only

Section I: Course Content

1. How much of the material presented in lectures was content that you needed to understand the rest of the course material?

none	little	some	most	all

2. In comparison to the number of lectures given in this course, how many would you suggest should have been given?

many less	few less	same	few more	many more

3. In comparison to the other courses you are now taking, how many opportunities were there in the course to have your questions answered?

many less	few less	same	few more	many more

4. Was the material available adequate to satisfy your independent study needs?

didn't need most	didn't need some	adequate	needed some more	needed much more

5. Was the material available in a usable form?

all was not	most was not	half and half	most was	all was

6. How adequate were the procedures for grading and evaluating your performance in this course?

very adequate	inadequate	so-so	adequate	very adequate

Section II: Study Time

1. How does the time you spent studying for this course compare with other 3 hour courses you are now taking?

much less	somewhat less	same	somewhat more	much more

2. To what extent has it been necessary to change your study habits as a result of taking this course?

almost none	little	some	much	almost completely

Section III: Course Value

1. How did the amount of individual work and self-direction required in this course compare with what you expected when you signed up?

much less	some less	about as expected	some more	much more

2. How much did you learn from this course in comparison to other courses you are now taking?

much less	some less	same	some more	much more

3. In comparison to other courses you are now taking, how much do you think you will remember from this course (in approximately six months)?

much less	some less	same	some more	much more

A final summary of the entire years' findings is presented at the end of the section. The data gathered through personal interviews and discussions with students and faculty are also presented in this section.

First Semester----Education

Education 163: Teaching the Language Arts of the Elementary School: The initial comparison between the regular and Macro students was made on the basis of their overall academic standing prior to entry into the program. As Table II indicates, the mean point hour ratio for the Macro students was higher ($\overline{X}$ = 2.697) than that of the regular group ($\overline{X}$ = 2.363). The t-test for this difference indicated that it was significant at the .05 level (t = 2.04, df = 50).

The comparison of primary interest was between the grades actually earned by the students in the Macro and regular groups. As can be seen from Table II, the mean of the Macro group was slightly lower ($\overline{X}$ = 2.24). However, this difference fell far short of the level required for significance (t - .38, df[1] = 49).

The Macro section had a total of thirty-one students enrolled at the beginning of the semester and of those thirty-one, twelve completed the typically fifteen week course in less than fifteen weeks.

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[1] The reason for the discrepancy between the number of df (50) for students entering the course and those completing it (49) is because one student withdrew prior to completion.

TABLE II
PREVIOUS GRADE POINT HOURS AND
GRADE IN COURSE

	N	GPA $\bar{X}$	t	Grade in Course $\bar{X}$	t
Educ 163					
Macro	31	2.697	2.04*	2.13	0.38
Regular	21	2.363		2.24	
Educ 165					
Macro	25	2.61	.73	2.64	1.86
Regular	19	2.475		3.05	
Educ 169					
Macro	9	2.56	1.56	2.71	0.02
Control	19	2.41		2.69	

* significant at .05 level

Table III

Attitudes

Education 163 - First Semester

(See Fig. 1 for the actual questions)

Item	1st Cycle	2nd Cycle	3rd Cycle	Macro Total	Control	Difference Macro - Control
Section I: Course Content						
1	2.41	2.54	2.57	2.50	2.81	-.31
2	3.09	3.00	3.22	3.10	1.86	1.24
3	1.68	2.04	2.09	1.94	2.33	-.39
4	2.14	1.83	2.39	2.12	1.95	.17
5	2.95	2.83	2.74	2.84	3.10	-.26
6	2.05	1.91	1.22	1.72	2.43	-.71
Section II: Study Time						
1	3.86	2.79	3.13	3.25	2.43	.82
2	2.77	2.25	2.43	2.48	1.24	1.24
Section III: Course Value						
1	2.82	2.62	2.65	2.70	2.86	-.16
2	1.50	1.33	1.73	1.52	2.19	-.67
3	1.55	1.71	1.74	1.67	2.29	-.62

Of the twelve who accelerated their program six completed the entire course in five weeks and six in ten weeks.

The attitudes of the students in the Macro and regular sections of Education 163 are summarized in Table III (see Fig. 1 for actual questions). In all instances, the comparisons and computations of differences are based on the means of the measures taken at the end of each of the three Macro cycles and the mean of the control group which was taken at the end of the fifteen week semester. (Note: a positive value in the last column of Table III indicates that the students in the Macro group gave a higher rating while a negative value indicates a higher rating for the regular method of teaching.)

Education 165 -- Teaching Arithmetic in the Elementary School:

Again the initial comparison was made on the basis of overall academic standing prior to entry into the progress. As Table II indicates, the mean point hour ratio of the Macro students was higher ($\overline{X}$ = 2.61) than that of the students in the control group ($\overline{X}$ = 2.475). However, this difference fell far short of significance (t = .73, df = 42).

The second comparison, between the grades earned by the Macro and regular students, (See Table II) indicates that the mean of the Macro students was somewhat lower ($\overline{\overline{X}}$ = 2.64) than that of the

Table IV

Attitudes

Education 165 - First Semester

(See Fig. 1 for the actual questions)

Item	1st Cycle	2nd Cycle	3rd Cycle	Macro Total	Control	Differences Macro - Control
Section I: Course Content						
1	3.24	3.00	4.00	3.27	3.50	-.23
2	3.00	2.64	3.20	2.92	2.33	.59
3	2.00	2.73	2.60	2.30	3.56	-1.26
4	1.81	2.00	2.00	1.89	2.00	-.11
5	3.38	3.50	3.60	3.44	3.72	-.28
6	2.00	2.27	2.00	2.09	3.39	-1.30
Section II: Study Time						
1	2.86	2.64	2.60	2.76	1.61	1.15
2	1.90	2.27	1.40	1.95	.72	1.23
Section III: Course Value						
1	2.48	2.73	2.60	2.57	1.78	-.79
2	2.00	2.45	2.60	2.22	3.56	-1.34
3	2.10	2.55	1.80	2.19	3.56	-1.37

students in the control section ($\bar{X}$ = 3.05). However, this difference was not significant (t = 1.86, df = 42).

Of 25 students initially enrolled in this course, 21 accelerated their programs. Of these 21, 12 completed the entire 15 week course in 5 weeks and 9 completed it by the tenth week.

The attitudes of the students are summarized in Table IV. Again, a positive number indicates that the Macro group was rated higher, a negative value indicates a higher rating by the regular group.

Education 169 -- Teaching of Science-Social Studies in the Elementary School: The initial comparison of the grade point averages of the Macro and regular students indicated once again (See Table II) that the overall average of the Macro students was slightly higher ($\bar{X}$ = 2.56) than that of the regular group ($\bar{X}$ = 2.41). However, this difference was not significant (t = 1.56, df = 26).

The comparison of major interest, between the grades earned by the students in the two groups, (See Table II) indicated that the Macro students were very slightly higher ($\bar{X}$ = 2.71) than the students in the control group ($\bar{X}$ = 2.69). This difference fell far short of significance (t = .021, df = 21).

Only nine persons were initially enrolled in the Macro section of this course, but of those nine, seven accelerated their

Table V

Attitudes

Education 169 - First Semester

(See Fig. 1 for the actual questions)

Item	1st Cycle	2nd Cycle	3rd Cycle	Macro* Total	Control	Differences Macro - Control
Section I: Course Content						
1	1.00	1.00		1.00	2.54	-1.54
2	3.00	2.40		2.62	2.25	.37
3	2.33	2.20		2.25	2.85	- .60
4	1.67	2.40		2.12	2.21	- .09
5	2.33	2.20		2.25	3.15	- .90
6	.33	1.00		.75	2.69	-1.94
Section II: Study time						
1	4.00	4.00		4.00	3.00	1.00
2	4.00	3.20		3.50	2.21	1.29
Section III: Course Value						
1	2.00	3.60		3.00	3.00	.00
2	1.00	1.40		1.25	2.43	-1.18
3	1.00	1.40		1.25	2.43	-1.18

3rd cycle terminated. no Macro students were left after two cycles.

* Based on the mean of two cycles

program. Six of the seven completed the course in five weeks and one completed it in ten.

The attitude summaries are presented in Table V. In this particular course, since all students had either finished or dropped the course by the end of ten weeks, there were no students in the third five-week session.

First Semester Summary for Education Courses

Considering first the comparison of academic standing of all students enrolled in the Macro and regular sections, the mean point hour ratio of the Macro students was 2.69; the mean of the students in the control sections was 2.48. The t-test of this difference indicated that it was not significant ($t = 1.84$, $df = 116$).

Of the total of sixty-five students initially enrolled in the Macro programs, a total of forty accelerated their program and completed the full semester course in five or ten weeks time. Of the forty, twenty-four completed the entire course in five weeks and sixteen completed it in ten.

The comparison of the attitudes of the students are summarized in Table VI. The actual questions are presented in Fig. 1. Briefly, however, the results from Section I of the questionnaire showed that there was tendency for the students to feel that there should have been

more lectures in the Macro section (Item 2), that there was less opportunity to have questions answered in the Macro sections (Item 3) and that the basis for grading in the Macro section was not as adequate as in the regular group (Item 6). From Section II it appears that students in the Macro group felt that they had to spend more time studying and also, they had to change their study habits somewhat (Items 1 and 2). The questions in Section III indicated that Macro students did not feel they had learned as much and also that their retention of the material would not be as high as that of the students in the regular group. (Items 2 and 3).

Table V I

Attitudes

Summary for all Education Courses - First Semester

(See Fig. 1 for actual questions)

Item	Macro	Control	Difference
Section I: Course Content			
1	2.66	2.90	- .36
2	3.01	2.12	.89
3	2.08	2.84	- .76
4	2.04	2.05	- .01
5	3.00	3.28	- .28
6	1.78	2.78	-1.00
Section II: Study Time			
1	3.13	2.40	.73
2	2.36	1.43	.93
Section III: Course Value			
1	2.67	2.61	.06
2	1.73	2.65	- .92
3	1.81	2.68	- .77

Civil Engineering 120: Statics: The comparison (See Table VII) between the point hour ratios of the regular and Macro students prior to their entry into the program indicated that the mean of the students in the Macro section was very slightly higher ($\bar{X}$ = 2.48) than that of the regular group ($\bar{X}$ = 2.45). The t-test of this difference showed it to be non-significant (t = .16 df = 53).

The comparison of the grades actually earned by the Macro and regular students showed that the grades of the Macro students were higher ($\bar{X}$ = 2.54) that those of the students in the control section ($\bar{X}$ = 2.40). This difference, however, was not significant (t = .37, df = 54).

Of the total of 25 students who initially entered the Macro section, five were able to accelerate their program. Of the five, two completed the course in five weeks and three in ten weeks.

The attitude comparisons of the Macro and regular students are presented in Table VIII. The questions were the same as those given the Education students and are presented in Fig. 1.

Civil Engineering 121: Dynamics: The comparison (See Table VII) between the point hour ratios of the Macro and control students indicated that the Macro students were slightly higher ($\bar{X}$ = 2.42 vs.

TABLE VII

Previous Grade Point Hour and
Grade in Course

Engineering	N	First Semester GPA	t	First Semester Grade in Course	t
Engr. 120 Macro	25	2.48	0.16	2.54	0.37
Regular	30	2.45		2.40	
Engr. 121 Macro	10	2.42	0.62	2.00	0.54
Regular	25	2.33		1.57	
Engr. 220 Macro	23	2.61	1.93	3.10	1.56
Regular	65	2.39		2.70	

Table VIII

Attitudes

Civil Engineering 120 - First Semester

(Actual Questions in Fig. 1)

Item	N=19 1st Cycle	N=14 2nd Cycle	N=14 3rd Cycle	N=47 Macro Total	N=28 Control	Differences Macro-Control
Section I: Course Content						
1	2.18	2.86	3.14	2.44	3.39	-.95
2	2.07	2.57	2.35	2.30	2.03	.27
3	1.26	2.07	2.85	1.97	3.42	-1.45
4	1.78	2.50	2.28	2.14	2.21	-.07
5	2.07	2.86	3.00	2.58	3.21	-.63
6	1.67	2.07	2.50	2.04	3.32	-1.28
Section II: Study Time						
1	2.22	2.50	1.64	2.13	2.14	-.01
2	1.37	1.57	1.71	1.53	1.14	-.39
Section III: Course Value						
1	1.59	2.29	2.42	2.05	2.39	-.24
2	1.41	2.00	2.50	1.91	3.10	-1.19
3	1.26	2.14	2.64	1.93	2.89	-.86

Table IX

Attitudes

Civil Engineering 121 - First Semester

(See Fig. 1 for Actual Questions)

Item	N=8 1st Cycle	N=4 2nd Cycle	N=5 3rd Cycle	N=17 Macro Total	N=13 Control	Differences Macro - Control
Section I: Course Content						
1	2.87	2.50	2.00	2.53	1.84	.69
2	2.50	2.00	2.60	2.41	1.07	1.34
3	1.50	3.00	2.00	2.00	2.38	-.38
4	2.38	1.75	2.00	2.12	1.07	1.05
5	3.00	3.25	2.60	2.94	2.61	.33
6	2.38	2.00	2.40	2.30	2.61	-.31
Section II: Study Time						
1	3.00	2.50	3.00	2.88	2.46	.42
2	1.62	1.25	2.00	1.64	1.00	.64
Section III: Course Value						
1	2.38	2.50	2.00	2.30	2.07	.23
2	1.75	2.00	2.40	2.00	1.92	.08
3	1.38	2.00	1.60	1.59	1.07	.52

$\bar{X}$ = 2.33). The *t*-test of this difference indicated that it was not significant (*t* = .62, *df* = 33).

The comparison of the grades actually earned showed the mean of the Macro students to be higher ($\bar{X}$ = 2.00) than that of the regular students ($\bar{X}$ = 1.57). However, this difference was not significant (*t* = .54, *df* = 19).

Of the total of ten students initially enrolled in the Macro section, two accelerated their program. Both completed the course in ten weeks.

The attitude measures are presented in Table IX. As in the previous tables, a positive value indicates that the Macro section was rated higher, a negative value means that the control section was higher.

Civil Engineering 220: Kinetics: The comparison (See Table VII) of the mean point hour ratios of the Macro and regular students showed the Macro students to be somewhat higher ($\bar{X}$ = 2.61 *vs.* $\bar{X}$ = 2.39). This difference fell just short of significance at the .05 level (*t* = 1.93, *df* = 89).

The comparison of the grades earned by the Macro and regular students showed a similar trend in that the mean of the Macro students was 3.10 while the mean of the regular group was 2.70. This difference, however, was not significant (*t* = 1.50, *df* = 86).

A total of twenty-three students enrolled in the Macro section and of this number, eleven completed the course in less than the full

semester. Seven completed the course in ten weeks and four completed it in five.

The attitude comparisons of the regular and Macro students are presented in Table X. As in all of the other comparisons, a positive difference score means the Macro students scored the item higher a negative value means that the score is lower than the students in the regularly taught section.

Table X

Attitudes

Civil Engineering 222 - First Semester

(Actual questions are presented in Fig. 1)

ITEM	1st Cycle	2nd Cycle	3rd Cycle	Macro Total	Control	Differences Macro-Control
Section I: Course Content						
1	3.30	3.43	3.52	3.40	3.40	0.0
2	2.70	2.33	2.47	2.52	2.09	.43
3	1.81	2.33	2.58	2.18	3.14	-.96
4	2.22	2.00	2.11	2.12	2.11	.01
5	3.07	3.33	3.29	3.21	3.59	-.28
6	2.96	3.00	3.17	3.03	3.50	-.47
Section II: Study Time						
1	2.89	2.62	2.35	2.66	2.12	.54
2	1.70	1.57	1.76	2.28	0.57	1.71
Section III: Course Value						
1	2.48	2.10	2.23	2.29	1.96	.33
2	1.85	2.57	2.76	2.32	3.12	-.80
3	2.04	2.57	3.00	2.46	2.44	.02

First Semester Summary for Engineering Courses

The comparison of the academic standing of all students enrolled in the regular and Macro sections showed that the mean point hour ratio of the Macro students was 2.53 as compared to 2.42 for the students in the regular sections. The t-test of this difference indicated that it was not significant ($t = 1.50$, $df = 179$).

A total of fifty-eight students enrolled in the Macro program, and of that number, twenty-three accelerated their program. Of the twenty-three who accelerated, thirteen completed the course in ten weeks and ten completed it in five.

The comparison of the overall attitudes of the Macro and regular students are presented in Table XI. (See Fig. 1 for the actual questions). Comparison of the summary table for the education with that of engineering shows that the degree of agreement was quite high.

Considering Section I first, it appears that the Macro students in engineering were not particularly concerned about the number of lectures given (Item 2) but, they did feel that there was less opportunity to have questions answered (Item 3) and also, that the basis of grading was not as adequate as in the regular group (Item 6). From Section II, it appears that the amount of time spent studying for the Macro and regular course was about the same (Item 1), but

Table XI

Attitudes

Summary of all Engineering Courses - First Semester

(See Fig. 1 for actual questions)

Item	Macro	Control	Difference
Section I: Course Content			
1	2.93	3.18	- .25
2	2.42	1.93	.49
3	2.08	3.11	-1.03
4	2.12	1.99	.13
5	2.94	3.34	- .40
6	2.57	3.32	- .75
Section II: Study Time			
1	2.49	2.17	..32
2	1.92	.79	1.13
Section III: Course Value			
1	2.03	2.10	- .07
2	2.12	2.94	- .82
3	2.15	2.38	- .23

the Macro students had to change their methods and habits of study somewhat (Item 2). The questions in Section III indicated that the Macro students showed a tendency to feel that they did not learn as much (Item 2), and a very slight tendency to feel that their retention would not be as high as that of the students in the regular group (Item 3).

Education 163: Teaching the Language Arts in the Elementary School. The analysis of the overall academic standing of the regular and Macro students (See Table II a) indicated that the mean point hour ratio of the Macro students was slightly higher ($\bar{X}$ = 2.52) than that of the regular students ($\bar{X}$ = 2.49). This difference was not sufficient to attain significance at the .05 level (t = .27, df = 35).

A comparison of the grades earned by the students in the two groups showed that the difference was sizable. The mean of the Macro group was 1.41, while the mean of the control group was 2.35. This difference was significant (t = 3.35, df = 35).

A total of nineteen students enrolled in the Macro section, but only one was able to finish the course in less than the full semester. This person completed it in ten weeks.

The comparison of the attitudes of the two groups is presented in Table III a. The same questionnaire was used during the second semester as the first.

Education 165: Teaching Arithmetic in the Elementary School. The comparison of the academic standing of the Macro and regular students (See Table II a) showed that the mean of the Macro group was slightly higher ($\bar{X}$ = 2.56 vs. 2.42). The t-test of this difference showed it to be non-significant (t = 1.56, df = 46).

Table IIa

Previous Grade Point Hour and Grade in Course

Education	N	Second Semester GPA $\bar{X}$	t	Grade in Course $\bar{X}$	t
Educ. 163					
Macro	19	2.52		1.41	
			.27		3.35*
Regular	18	2.45		2.35	
Educ. 165					
Macro	18	2.56		2.31	
			1.56		.08
Regular	30	2.42		2.29	
Educ. 169					
Macro	11	2.65		2.54	
			1.89		2.29*
Regular	25	2.48		2.93	

*significant at .05 level

Table III a

Attitudes

Education 163 - Second Semester

(See Fig. 1 for actual questions)

ITEM	1st Cycle	2nd Cycle	3rd Cycle	Macro Total	Control	Difference Macro - Control
Section I: Course Content						
1	2.85	2.54	2.00	2.42	2.53	- .09
2	2.85	3.00	2.37	2.69	1.58	1.11
3	2.31	2.45	2.12	2.27	2.00	.27
4	2.15	2.00	2.75	2.34	1.79	.65
5	3.23	3.00	2.75	2.97	3.00	.03
6	1.85	1.91	1.62	1.77	2.26	-.49
Section II: Study Time						
1	3.31	2.64	1.62	2.44	2.21	.23
2	2.15	2.09	1.75	1.97	1.32	.22
Section III: Course Value						
1	2.67	2.64	2.62	2.64	2.42	.22
2	1.92	1.73	1.24	1.53	2.16	-.73
3	2.15	2.09	1.25	1.77	2.32	-.55

Table IVa

Attitudes

Education 165 - Second Semester

(See Fig. 1 for the actual questions)

ITEM	N=10 1st Cycle	N=9 2nd Cycle	N=8 3rd Cycle	N=27 Macro Total	N=31 Control	Differences Macro - Control
Section I: Course Content						
1	3.40	3.50	3.60	3.49	3.17	.32
2	2.90	2.89	3.00	2.92	2.38	.54
3	2.11	2.78	2.80	2.53	2.90	-.37
4	2.30	1.89	2.00	2.07	2.45	-.38
5	2.90	3.11	3.80	3.23	3.00	.23
6	2.10	1.22	2.20	1.83	1.86	.03
Section II: Study Time						
1	2.90	1.67	2.00	2.22	1.86	.44
2	1.80	1.44	1.00	1.44	1.28	.16
Section III: Course Value						
1	2.10	2.67	2.20	2.31	2.24	.07
2	1.50	1.56	1.60	1.54	2.28	-.74
3	1.50	2.11	1.80	1.79	2.66	-.87

The comparison of the grades earned by the students in the two groups showed the Macro section to be very slightly higher ($\bar{X}$ = 2.31 vs. 2.29), but this difference was not significant (t = .08, df = 42).

Eleven of the eighteen students enrolled in the Macro section completed the course in less than fifteen weeks. Of these eleven, five completed the course in ten weeks and six completed it in five.

The summary of the attitudes of the Macro and regular students is presented in Table IV a.

Education 169: Teaching of Science- Social Studies in the Elementary School. The comparison of the overall academic records of the Macro and regular students (See Table II a) indicated that the Macro students were somewhat superior ($\bar{X}$ = 2.65 vs. 2.48), but that this difference was not significant (t = 1.89, df = 34).

The grades earned by the students in the regular section were higher ($\bar{X}$ = 2.93) than those of the Macro students ($\bar{X}$ = 2.54). This difference was significant (t = 2.29, df = 37).

In this particular Macro section, all eleven of the students enrolled accelerated their programs with five completing the course in ten weeks and six in five weeks time.

Table Va

Attitudes

Education 169 - Second Semester

(See Fig. 1 for the actual questions)

	N=7	N=5	2	14		
ITEM	1st Cycle	2nd Cycle	3rd Cycle	Macro Total	Control	Differences Macro-Control
Section I: Course Content						
1	1.71	1.00	3.00	1.64	No	
2	3.29	3.80	3.00	3.43	Control	
3	2.57	2.40	4.00	2.71	Data	
4	2.57	2.00	1.00	2.14	Was	
5	3.00	2.40	2.50	2.71	Collected	
6	2.14	2.80	2.00	2.35		
Section II: Study Time						
1	3.71	4.00	4.00	3.85		
2	3.00	3.20	3.50	3.14		
Section III: Course Value						
1	3.71	3.60	3.50	3.64		
2	1.00	1.00	1.50	1.07		
3	1.29	2.00	3.50	1.85		

Summary of All Education Courses

Second Semester

The comparison of the academic standing of all students enrolled in the Macro and regular classes showed that the mean point hour ratio of the Macro students was 2.56 *vs.* 2.46 for the students in the regular sections. This difference, however, was not significant (*t* = 1.80, *df* = 119).

The analysis of the grades earned by all students in the Macro and regular sections showed the mean of the regular students to be higher than that of the Macro students ($\bar{X}$ = 2.53 *vs.* 2.00). This difference was significant well beyond the .05 level (*t* = 5.63, *df* = 118).

A total of forty-eight students enrolled in the Macro sections and of this number, twenty-three accelerated their programs. Of this number eleven completed the course in ten weeks and twelve completed it in five weeks time.

The summary of the attitude measures is presented in Table VI a. Because of low enrollment in the last cycle of Education 169, the mean attitude measure is based on only the reports of the students in the 163 and 165 control sections. From Section I of the summary data it can be seen that the Macro students again felt that there should have been more lectures (Item 2) but contrary to the first semester data, there was very little difference in the opportunity which the Macro and regular students felt they had to get questions

answered. (Item 3). Also, there was little difference between the Macro and regular students regarding the adequacy of grading (Item 6).

From Section II it can be seen that the Macro students felt that they had to study more than the regular students (Item I) and also that they changed their study habits to a greater extent (Item 2). These results are consistent with the findings of the first semester.

The results from Section III are almost identical with those of the first semester in that Macro students felt that they learned less and also, that they would retain less (Items 2 and 3). One slight deviation from the first semester's findings was that Macro students tended to feel that the amount of self-direction required for the course was actually more than they expected (Item 1).

Table VIa

Attitudes

Summary for Education - Second Semester

(See Fig. 1 for the actual questions)

ITEM	MACRO	CONTROL	DIFFERENCES
Section I: Course Content			
1	2.64	2.92	- .28
2	2.89	2.07	.82
3	2.43	2.55	- .12
4	2.21	2.19	.02
5	3.01	3.00	.01
6	1.89	2.01	- .12
Section II: Study Time			
1	2.61	1.99	.62
2	1.99	1.29	.70
Section III: Course Value			
1	2.70	2.30	.40
2	1.45	2.23	- .78
3	1.79	2.53	- .74

Civil Engineering -- Second Semester

Engineering 120 - Statics: The analysis of the point hour ratios of the Macro and regular students (See Table VII a) showed that the mean of the regular section was very slightly higher than the Macro section ($\bar{X}$ = 2.40 vs. 2.37). This difference did not approach significance (t = .20, df = 59).

The grades earned by the Macro students tended to be higher ($\bar{X}$ = 2.39) than those earned by the students in the control section ($\bar{X}$ = 2.13), but this difference was not significant (t = .70, df = 59).

Of the twenty-three who enrolled in the Macro section, nine completed the course in less than a full semester. Five finished in ten weeks and four in five weeks time.

The attitude measures of the Macro and control sections are represented in Table VIII a.

Engineering 121 - Dynamics: A comparison of the academic standing of the Macro and regular students showed that the mean point hour ratio of the Macro students was slightly higher ($\bar{X}$ = 2.26, vs. 2.24). This difference was not significant (t = .17, df = 35).

The grades earned by the students in the Macro section also tended to be higher ($\bar{X}$ = 2.23 vs. 2.11) but again, this difference was not significant (t = 1.02, df = 37).

Of the thirteen students enrolled in the Macro section, three accelerated their programs, one completed the course in ten weeks

and two completed it in five.

The attitude measures and comparisons between the regular and Macro students are presented in Table IX a.

Table VIIa

Previous Grade Point Hour and
Grade in Course

Engineering	Second Semester				
	N	GPA	t	Grade in Course	t
Engr. 120					
Macro	23	2.40		2.39	
			0.20		0.70
Regular	38	2.37		2.13	
Engr. 121					
Macro	13	2.26		2.23	
			0.17		1.02
Regular	24	2.24		2.11	
Engr. 220					
Macro	21	2.35		3.19	
			0.36		1.33
Regular	33	2.30		2.79	

Table VIIIa

Attitudes

Civil Engineering 120 - Second Semester

(See Fig. 1 for the actual questions)

ITEM	1st Cycle	2nd Cycle	3rd Cycle	Macro Total	Control	Differences Macro-Control
Section I: Course Content						
1	3.36	3.43	2.54	3.12	3.43	- .31
2	2.64	2.29	2.38	2.44	2.00	.44
3	1.78	2.79	2.77	2.44	3.19	- .75
4	2.29	2.43	2.08	2.27	2.14	.13
5	3.14	3.00	2.85	3.00	3.05	-.05
6	3.21	2.84	2.46	2.85	3.14	- .29
Section II: Study Time						
1	2.78	2.29	2.08	2.39	2.29	.10
2	1.43	1.21	1.62	1.42	1.14	.28
Section III: Course Value						
1	2.71	2.43	2.38	2.51	2.43	.08
2	2.07	2.21	2.08	2.12	2.76	- .64
3	2.36	2.14	2.62	2.37	2.81	- .44

Table IX a

Attitudes

Engineering 121 - Second Semester

(See Fig. 1 for the actual questions)

ITEM	N=6 1st Cycle	N=9 2nd Cycle	N=8 3rd Cycle	N=23 Macro Total	N=19 Control	Differences Macro - Control
Section I: Course Content						
1	2.17	1.67	1.12	1.61	2.95	-1.34
2	2.50	3.00	2.00	2.52	2.37	.15
3	2.17	2.11	2.50	2.26	2.37	-.11
4	2.17	2.78	2.25	2.44	2.42	.02
5	2.50	2.22	2.38	2.35	2.74	-.39
6	2.33	2.22	2.38	2.30	2.63	-.33
Section II: Study Time						
1	2.83	2.22	2.63	2.52	2.53	-.01
2	2.00	2.33	1.88	2.09	1.16	.93
Section III: Course Value						
1	2.17	2.00	2.75	2.30	2.37	-.07
2	2.33	1.89	2.50	2.21	3.26	-1.05
3	1.83	2.11	2.25	2.09	2.42	-.33

Table X a

Attitudes

Engineering 222 - Second Semester

(See Fig. 1 for the actual questions)

	N=18	N=17		N=35	N=28	
ITEM	1st Cycle	2nd Cycle	3rd Cycle	Macro Total	Control	Differences Macro-Control
Section I: Course Content						
1	3.5	3.35	Don't	3.43	3.36	.07
2	2.5	2.24	Have	2.37	2.18	.19
3	2.72	2.71	3rd	2.72	3.64	-.94
4	2.06	2.00	Cycle	2.03	2.07	-.04
5	3.17	3.24		3.20	3.29	-.09
6	3.39	3.35		3.37	3.39	-.02
Section II: Study Time						
1	2.39	2.06		2.23	1.89	.34
2	1.72	1.35		1.54	1.04	.50
Section III: Course Value						
1	2.11	2.18		2.14	1.89	.25
2	2.28	2.59		2.43	3.11	-.78
3	2.22	2.35		2.28	2.61	-.33

2 OF 2

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Engineering 222 - Kinetics: Analysis of the overall academic standing of the Macro and regular students showed that the mean point hour ratio of the students in the Macro section was very slightly higher ($\bar{X}$ = 2.35 vs. 2.30). This difference did not approach significance (t = .36, df = 52).

Comparison of the grades earned by the students in the two groups revealed that the mean grade of the Macro group was higher ($\bar{X}$ = 3.19 vs. 2.79), but that this difference was not significant (t = 1.33, df = 48).

Of the twenty-one students initially enrolled in the Macro section, seven completed the course in ten weeks and four completed it in five weeks time.

The summary of the attitudes of the Macro and regular students is presented in Table X a. Since no evaluation questionnaire was given during the third five-week session of the Macro program, the "macro total" is based on the mean of the first and second five-week sessions.

Summary for Engineering Courses

Second Semester

The comparison of the academic standing of all students enrolled in the Macro and regular sections revealed that the mean point hour ratio of the Macro students was almost identical with that of the students in the control sections ($\bar{X}$ = 2.34 vs. 2.32).

The analysis of the grades earned by the Macro and regular students showed that the mean grade of the Macro students was somewhat higher ($\bar{X}$ = 2.65) than the mean of the students in the control sections ($\bar{X}$ = 2.33). However, this difference was not sufficient to attain significance at the .05 level. (t = 1.50, df = 1.48).

Of the total of fifty-seven students enrolled in the Macro sections, twenty-three accelerated their programs. Of these twenty-three, thirteen completed the course in ten weeks and ten completed it in five weeks time.

The attitude comparisons of the regular and Macro students are presented in Table XIa. From this data it can be seen that the Macro students again felt that they had less opportunity to have their questions answered (Item 3), but there was little difference between the regular and Macro students regarding the adequacy of grading (Item 6).

From Section II, it can be seen that Macro and regular students reported that they spent about equal amounts of time studying, but the Macro students changed their study habits somewhat more (Items 1 and 2).

From Section III, the Macro students again reported that they felt they learned less (Item 2) and also, there was a slight tendency to feel that they would retain less (Item 3).

Table XIa

Attitudes

Summary for Engineering Second Semester

(See Fig. 1 for the actual questions)

ITEM	MACRO	CONTROL	DIFFERENCES
Section I: Course Content			
1	2.90	3.26	-.36
2	2.43	2.17	.26
3	2.49	3.14	-.65
4	2.22	2.18	.04
5	2.92	3.06	-.14
6	2.90	3.10	-.20
Section II: Study Time			
1	2.36	2.19	.17
2	1.59	1.10	.49
Section III: Course Value			
1	2.34	2.19	.15
2	2.23	3.04	-.81
3	2.28	2.61	-.33

Student Interviews and General Appraisal

In addition to the objective measures of students reaction which were presented in Fig. 1, open-ended questions were also included in the questionnaire and are presented in Fig. 2. These questions were asked of all students. Because of the general nature of the questions and the answers it was very difficult to code answers and place them into exact categories. Coupled with this scoring problem was the fact that many students either failed to answer the questions or simply wrote something such as "didn't notice much difference from other classes" or "nothing particular comes to mind". Consequently, the report of this data will be made in terms of specific answers which occurred most frequently, and where possible, the percentage of the total number who answered the question in a particular manner will also be given.

The data will simply be reported by course area and will be divided according to particular class or by semester. All answers refer to Macro students only.

Fig. 2

Open-end Questions Used For Both Semesters

1. Comment briefly on the extent to which a "learning atmosphere" characterized this course.

2. In your judgement, what was the most valuable aspect of the course?

3. In your judgement, what was the least valuable aspect of the course?

4. What suggestions would you offer for changing the course?

5. What recommendations would you make to other students who are thinking about signing up for this course?

Education

There was fairly general agreement that the student benefited from (1) an initial presentation of an over-view of the course; (2) emphasis on important concepts; (3) small classes; (4) opportunity for independent work; and (5) opportunity for acceleration.

They mentioned as disadvantages: (1) too few tests, and (2) feeling of extreme pressures for work.

Suggestions for changing the course included: (1) scheduling more or longer class meetings; (2) lengthening the course to half a semester; and (3) providing time for some tests prior to the final.

Although many students mentioned the possibility of acceleration as an advantage, they also indicated only a few students could do the work required for acceleration. Some suggested other students should attempt Macro sections only if they had a light load. Several indicated they would not recommend Macro sections to other students.

Some students who had taken a course for two or three cycles mentioned the frustration and loss of confidence which they experienced after the first cycle. This seemed to be associated with lowered interest and motivation during the second and third cycles. They indicated feeling that only good students who did not have outside jobs could expect to succeed in one cycle.

Some also mentioned concern over the possibility of grades in Macro sections delaying student teaching. They suggested any student considering Macro sections for methods schedule it earlier than the semester prior to student teaching.

Some suggestions for change included coordination of the three courses so a student could take one or two in half-semester Macro cycles and one or two in regular semester sequences. They also suggested that courses other than methods courses might be more appropriate for independent study. Courses cited all had more emphasis on reading content material and less on demonstrations and techniques. Some students who finished one course in ten weeks and did not enroll for another reported this decision was based on the need to use time on other courses and the feeling that they would not be successful in one cycle.

General Summary of Student Reactions:

There was general support for the possibility of acceleration for students who have a good academic background, are highly motivated, and have adequate time for study.

There were suggestions that the course be lengthened to half-semester or that more meetings be scheduled.

There were also suggestions that this format might be more appropriate for lecture--reading type courses than for courses requiring extensive student participation.

Engineering

The students in the engineering courses agreed to a considerable extent that the Macro section was conducive to learning and that a learning atmosphere prevailed. Only eight percent of those reporting were definitely negative, 29 percent gave answers which were generally favorable, but which were qualified in some fashion while the remaining 63 percent reported only favorable answers.

The second question concerning the most valuable aspect of the program resulted in a wide variety of answers. The one answer which occurred most frequently was "Macro program permits individual initiative". This occurred in 23 percent of the reports. The next most common report was "provides opportunity to accelerate my program". This answer occurred on 19 percent of the reports. Other answers which occurred with relatively high frequency were, "repetition over cycles leads to better understanding", 14 percent; and, "eliminated trivia", five percent.

The least valuable aspect of the program according to 36% of the respondents was that it progressed too rapidly. In conjunction with this it is interesting to note that the suggestion made most often for improving the course was "lengthen the cycles" which occurred

on 12% of the reports. Also, the same percentage recommended that the complete solutions to all problems be given so that the students could check their work entirely.

The recommendation which would be made to other students indicated an overall appreciation of the Macro program.

A total of 51% recommended that others should sign up, 39% either had no opinion or did not answer the question and only 10% would not recommend the program to others. Of those recommending the course, many suggested that new students should be warned to "keep up with the problems", "budget your time", etc.

In addition to the open-ended questions, individual interviews were conducted with several students who fell into one of the following categories. Many of the questions asked were similar to those asked as part of the objective portion of the questionnaire. This was felt advisable in order to permit general comments by the student to these questions.

Category "1", two students who earned an A grade in a Macro course, and who completed more than one course in a semester; Category "2", two students who earned an A grade in a Macro course, but did not go on to another Macro course; Category "3", one student who earned a C grade in three cycles of a Macro course. Category "4", two students who failed a Macro course.

The questions discussed, and the opinions of students in the various classifications, are presented below.

The amount of time spent studying for the Macro course as compared with study time for other courses: One of the students in the first category felt that he spent just about as much time studying for the Macro course as he did for his other courses, while the other student indicated that he studied less for the Macro course than he did for the other courses. One student in Category "2" said he studied "alot more" for the Macro course; the other student felt that he studied a little more for the Macro course. The student in the third category indicated that he put in a great deal more time studying for the Macro course than he spent studying for his other courses. Both students in the fourth category studied a little more for the Macro course "especially in the first cycle."

Adjustments in study habits needed to cope with the Macro Courses. The Macro students in all categories generally felt that they employed basically the same approach to studying for the Macro courses as they used in other courses; they indicated that more of the burden was placed upon the student, and a high premium was placed on working of the problems assigned.

The amount of material learned in the Macro course as compared with other courses: One student in Category "1" emphatically stated that he "seriously doubted" whether one could learn as much in five weeks as one could grasp in fifteen. He suggested that perhaps seven to ten weeks would be a more realistic time period for a cycle. The other student felt that he learned more in the Macro course than in regular courses. One student in the second category felt that he learned about the same, while the other felt that he was "gyped". The student in the third category felt that he learned more in the Macro course, because he had to "dig into the work harder". One student in the fifth category said he learned about the same in the Macro course as in other courses. The other individual felt that he learned more in the Macro course than in any other course he had taken. (He was interviewed just after he had completed his sixth cycle in one of the Macro courses).

The amount of material retained in the Macro course vs. the amount retained in other courses: One student in category "1" felt that he may have retained a little more of the Macro course material especially since he was able to use the material he learned in one of the courses quite soon in a succeeding course. The other student felt that, at best, he would retain as much of what he learned

in the Macro course as he would retain from other courses. One student of Category "2" believed that he would retain enough of what he learned in one Macro course to "make it" in the succeeding Macro courses. The other student felt that in five weeks an individual could not retain much of the material, but that a student having attended three five-week cycles would probably be better off than a "regular" student. The student in the third category thought that since he learned more in the Macro course, he would remember more. One student in the fourth category thought he would remember more from the Macro course, while the other felt he would remember about the same amount as in other courses.

The most useful aspect of the course under consideration:

Most of the Macro students felt that the possibility of finishing a course in less than fifteen weeks was the most valuable aspect of the program. It was also agreed that the repetition provided by going through more than one cycle of a course was valuable.

The least valuable aspect of the course under consideration:

In general, the speed at which the courses were conducted was the "least valuable" aspect of the Macro Programs. Several problems cited as stemming from the rapidity of the courses were: tendency to give up and wait until next cycle; inadequate covering of some material; students' inability to learn and retain as much of the material as would be desirable.

Macro students' suggestions to other students contemplating taking a Macro course: All of the Macro students interviewed felt that it would be worthwhile to give a Macro course a try; they all suggested that a student KEEP UP WITH THE PROBLEMS.

Students' general comment: These generally were of the following type: "More material is covered in three Macro cycles than in a regular fifteen week course." "More tests should be given." "Sample problems and answers from various categories problems should be passed out." "Five weeks is much too short." "A lot depends on the Professor."

Personality Variables

In addition to evaluation based on grades received and attitudes toward the Macro Program, the California Personality Inventory was also administered to determine if there were consistent personality characteristics which could be identified as relevant to success in the program. Because of possible contamination and lack of cooperation which might have resulted from requiring students to participate in the testing program, this was left as voluntary. Approximately 60% of the students participated.

The two measures which were correlated with the twenty-two personality variables (dominance, capacity for status, sociability, social presence, self acceptance, well being, responsibility, sociali-zation, self control, tolerance, good impression, communality, achievement, intellectual efficiency, psychological mindedness, flexibility, femininity, dogmatism, anxiety, social competence, and agreement) were actual grade received in the course (coded as 4, 3, 2, 1, or 0) and, the amount of acceleration achieved by participating in the program (coded as 1, 2, or 3 depending upon whether the course was completed in five, ten, or fifteen weeks).

The one major finding in the table of correlations which is presented in Appendix A is that there is a notable lack of consistent relationship between any of the personality characteristics purportedly

measured by the CPI and success in the program. The only significant correlation at the .01 level between communality and acceleration (r = .3064). Since a total of forty-eight correlations were computed using the two measures of success, this one significant finding was very likely due to chance factors only.

While several explanations could be offered for this lack of findings, there are two which appear to be most tenable. First, there may well be no singular and consistent personality variable which is exhibited by students who are successful in this type of program. Common sense would certainly lead to the acceptance of this suggestion. Second, a test such as the CPI is designed primarily as a measure of personal adjustment and, as such, may be invalid for uses in measuring personality characteristics as they apply to the specific academic situation.

Faculty comments, criticisms, and suggestions

Faculty were asked to fill out a rating scale and questionnaire at the end of each five weeks during the first semester and at the end of the second semester. Supplementary reactions were also collected during interviews.

Education Instructors:

The primary value, as seen by the instructors, was the opportunity for acceleration by able students. The success of fairly large numbers of students completing a course in five weeks or ten weeks indicated that many are capable of more rapid progress than is possible in conventional courses.

The faculty also felt that the Macro programmed curriculum gave the students an overview of the course which was particularly valuable if the student did not finish in one phase. The instructors also provided more flexibility in teaching than is usually the case in regular sections.

There was agreement amoung the instructors that the students felt extreme pressure which may have interferred with their performance. Some students seemed not to understand the experimental nature of the program and expressed disappointment and discouragement when they did not succeed in one phase. Also, some students with good academic records felt they received a grade at least one letter lower because they attempted a Macro section. The fewer class meetings and the student's feelings of pressure resulted in a loss of communication.

The faculty indicated that evaluation was necessarily limited to more restricted objectives because of the fewer class meetings, resulting in grading procedures and standards which may not have been comparable to regular sections.

They reported having spent much more time in preparation during the first phases, but that the extra time required decreased as they developed appropriate materials.

Generally, the instructors expressed concern over mastery of content. Since evaluations were based primarily on evidence obtained in verbal situations, some students may have had good verbal mastery without adequate development of the basic skills which are the objectives of these courses.

There was some feeling that student reaction was more varied than in regular sections. Some students reacted favorably, but others reacted very unfavorably.

Suggestions:

The faculty felt that more careful selection and pre-orientation of students is necessary for this type of program. Many seemed not to have comprehended the nature of the program and the demands on the students until they had failed one phase. Individual pre-counseling to assure self-selection based on understanding might have reduced many of these problems. Careful selection may need to include conferences and consideration of grade point averages.

It was also suggested that it would be desirable to schedule a Macro section and a regular section at the same time to avoid forcing a student to take a Macro section because no regular section is available. There was some evidence that some students had no interest in acceleration, but the Macro section was the only one available.

There were suggestions that the Macro sections should be for half a semester rather than one third, or that the time vary with courses.

The instructors also felt that the Macro program may be more appropriate for lecture courses than for activity courses such as those used for the education portion of the Macro program. The students in lecture courses may have more opportunity to fill in material by additional reading while the activities omitted cannot be covered by reading.

The instructors also expressed the feeling that there should be agreement among instructors to provide more consistency about procedures. This seemed particularly acute when students repeated a course. In some courses each phase was independent, and students did all assignments and projects each time. In other courses a unit or project which was satisfactory when first done was accepted for that requirement during subsequent phases.

Engineering Instructors:

The overall feeling of the instructors was that the program worked quite well. The major advantage seen by each was that students were able not only to speed their progress through the sequence of courses, but if they desired, they were also able to drop out of the program for five or ten weeks to spend additional time on other courses.

Although considerably more time was required initially to prepare materials for the Macro sections, the time demands during the actual program (both for lecture preparation and individual aid to students) were not felt to be much greater than the regular sections. However, one instructor reported that the problem of phasing, or maintaining a continuity between the five week sections and the regular section was somewhat of a problem. A recommendation was made that an individual instructor be assigned to Macro sections and then, only for one year. One reason for this suggestion was that with the course essentially being repeated every five weeks, the relatively easy tasks such as citing pertinent examples, effectively using various methods of presentation, and particularly, exam questions, become increasingly harder to organize and present without repetition and redundancy.

A related problem mentioned by two instructors was that after the first five weeks students' varying achievement levels placed them in several chapters covering different types of subject matter. Because

of this, class time could not be used as efficiently as desired. This presented a particular problem when students progressing at different rates raised questions which were, of course, important to them, but were of little value to the rest of the class. All of the instructors, however, felt that the number of questions asked and the requests for individual aid were not any greater than in the regular sections.

For two of the instructors, attendance dropped markedly after the first five week session during the first semester. Several factors may have contributed to this drop, but regardless of what they actually were, the giving of mid-term (mid five-week) examinations was the solution. Apparently exams were necessary to keep "interest" and force good study and attendance habits. Stated another way, a high proportion of the students were apparently not sufficiently "mature" to adapt to the freedom present when only a single exam was given.

One of the instructors indicated a potential problem existed in his course; that of its becoming a "graveyard" for individuals who had failed during the first semester, i.e. individuals who failed during the first term, either in the regular or five week sessions, could simply take the Macro program to erase more quickly the failing grade. While this would indeed be a benefit of the Macro program, it is apparent that the use of the Macro courses as five week tutoring sessions could cause

the program to become geared to exactly the opposite type of student from those for whom it was originally intended. However, it must be noted, that in the one class where the number of students who had previously failed the course was relatively large, their presence did not seem to hinder the rapid progress of the advanced students who were enrolling in the course for the first time. Thus, the course appeared to work very well, but it did cause the instructor to feel that he could be "victimized" by the system so that the students might be sub-par to a considerable extent.

One of the major problems noted by all instructors was that the flow of students from one section to another was impaired either by lack of sufficient courses in the program (e.g. a student who had taken a terminal course in sequence and then had nothing else to take for the five or ten week period), or, when there actually was another course available, the time remaining in the semester was often thought to be not sufficient to complete the new course.

Another problem was mentioned regarding testing. Because of time limitations, the Macro students are not tested as much, and therefore the evaluation per term (4 hrs. of examination per five week session vs. 6 hr. of exams per semester) might not be as good. However, for a student who stays in a Macro section for more than five weeks, the hours that he is tested are actually greater, and therefore, might well result in a better evaluation.

A fourth problem raised concerned the requirement that a student take a "B" grade and move on. For some students who were exceptionally able, a "B" grade was not acceptable and rather than take the chance of possibly getting a "B" these students often did not attempt to take the exams, but rather waited another five weeks to be sure of their "A". Along this same line, there were several students who, because of their past coursework, are unable to move to another section because they had completed the other courses before enrolling in the Macro program. While arrangements were made to permit these students to take "special problems" courses, this was not very satisfactory.

There was some disagreement over the amount of "enthusiasm" shown by the Macro students, particularly during the second and third five week sessions. One instructor reported a high level of interest during the entire fifteen week period, while the others felt that many students were overwhelmed by the pace and thus became completely lost and gave up. As a result of this and being forced to repeat because of inadequate performances, many students apparently felt that they were being used merely as guinea pigs. This resulted in some resentment toward the program.

The feeling with respect to how much students learned was as follows. One instructor felt that the good students learned as much in five or ten weeks as they typically learn in the usual fifteen

week session. However, because of repetition, by being forced to re-take the course for additional five week periods, the poorer students actually learn more. The other instructors felt much the same way, but qualified to point out that there might be differences between "short term" or immediate application ability and long term benefits. The short term benefits were thought to be somewhat lower in the Macro students because they had not had opportunity to drill and work problems as much, while in terms of the long term benefits, the Macro students would probably gain as much since they had experienced all of the material.

In general, during the second semester as more information about the program became available, students showed greater interest and seemed generally to favor the program. All instructors in the Engineering courses indicated some degree of surprise that it had worked as well as it did. In addition to speeding the students progress through the engineering courses, the Macro program approach was seen as a possible real boost to the Engineering student (if the program were carried out in other departments) by permitting the student to satisfy quickly various humanities, etc. requirements, particularly if the student is highly able, thus permitting the total number of semesters required to obtain an engineering degree to be reduced. As mentioned, the general consensus was that the program was successful and warrants consideration not only in other engineering courses, but in other departments as well.

Summary

The Macro-Programmed Curriculum was designed to provide students at all ability levels an opportunity to determine the pace of their training. Under this program, each semester was divided into three five week sessions. During each of these sessions a full semester course was offered. Evaluation of each five week period determined which students had demonstrated sufficient mastery of content to complete the course. Other students repeated the course during the following five week session.

The three courses in Education used for the Macro-Program all involved the learning of methods of teaching in elementary school: Language Arts, Arithmetic, and Social Studies - Science.

The three Engineering courses were from the Civil Engineering sequence: Statics, Dynamics, and Strength of Materials.

Approximately one third of all students enrolled in each program accelerated their programs. Of these, more than half required ten weeks to complete the course.

The attitudes of both students and faculty were assessed by questionnaires, supplemented by interviews with each faculty member and with a sample group of students.

Education: There was general agreement among faculty and students that this program offerred some advantages to many students. However,

both reported problems and need for modifications to reduce problems. The major advantages were the possibility of acceleration, increased flexibility, and the opportunity for an introductory overview. The major disadvantages were extreme time pressure and lack of consistency in procedures among instructors.

Suggestions for change included: (1) more adequate selection and orientation of students, (2) lengthening the session to half a semester, (3) selecting lecture courses rather than activity courses, and (4) establishing some procedures to provide consistency for all sections.

Engineering: Reaction of both faculty and students was generally favorable. There was substantial agreement that the opportunity for acceleration was one of the most valuable aspects of the program. Increased flexibility and opportunity for student initiative were also mentioned as valuable.

Problems associated with time pressures and with grading seemed to be the cause of most of the unfavorable reactions. Both faculty and students expressed awareness of extra time demands. For the faculty this was primarily during the first cycle. However, they did report difficulty in providing variety in presentation and in testing in successive cycles. Attitudes toward testing and grading were more favorable at the end of the second semester when adjustments had been made to include both a mid-term and a final in each cycle.

Recommendations:

1. Macro-programmed courses should be considered for the honors program.
2. Macro-programmed sections of many lecture courses should be scheduled for any student electing them.
3. Macro-programmed sections should be scheduled for half of the academic term.
4. Modifications suggested by these faculty and students be considered in planning future Macro-programmed sections.

APPENDIX A

CORRELATIONS

Coding of Variables

1. . . . . Dominance
2. . . . . Capacity for Status
3. . . . . Sociability
4. . . . . Social Presence
5. . . . . Self Acceptance
6. . . . . Sense of Well Being
7. . . . . Responsibility
8. . . . . Socialization
9. . . . . Self Control
10. . . . . Tolerance
11. . . . . Good Impression
12. . . . . Communality
13. . . . . Achievement via conformance (C Achievement)
14. . . . . Achievement via Independence (I Achievement)
15. . . . . Intellectual Efficiency
16. . . . . Psychological Mindedness
17. . . . . Flexibility
18. . . . . Feminity
19. . . . . Dogmatism
20. . . . . Anxiety
21. . . . . Social Competence
22. . . . . Agreement
23. . . . . Acceleration
24. . . . . Grades received

R. =	1	2	3	4	5	6	7	8
ANS=	15.4205	16.5568	13.5000	25.4659	9.9205	15.7386	22.7727	16.1818
D.S=	2.1884	2.6018	2.5540	3.4442	1.8661	2.1186	2.6787	3.0953

R. =	1	2	3	4	5	6	7	8
Y = 1	1.0000	-0.0191	-0.0010	0.2560	-0.0669	0.0065	0.4273	0.1934
Y = 2	-0.0191	1.0000	0.2523	0.1055	0.0583	0.1542	-0.0747	-0.2820
Y = 3	-0.0010	0.2523	1.0000	0.0937	-0.0870	-0.0536	-0.1495	-0.0374
Y = 4	0.2560	0.1055	0.0937	1.0000	0.2639	0.1195	0.3305	-0.2669
Y = 5	-0.0669	0.0583	-0.0870	0.2639	1.0000	-0.1059	0.0578	-0.2355
Y = 6	0.0065	0.1542	-0.0536	0.1195	-0.1059	1.0000	0.2499	-0.2613
Y = 7	0.4273	-0.0747	-0.1495	0.3305	0.0578	0.2499	1.0000	-0.0443
Y = 8	0.1934	-0.2820	-0.0374	-0.2669	-0.2355	-0.2613	-0.0443	1.0000
Y = 9	-0.1630	-0.1563	-0.4167	-0.3186	-0.0076	-0.1797	-0.2884	0.2948
Y =10	0.0623	-0.0522	-0.0865	-0.0123	-0.1346	0.1132	0.0829	0.0101
Y =11	-0.0655	-0.1978	-0.2431	-0.2320	-0.0908	-0.3338	-0.1993	0.3912
Y =12	0.1547	-0.0570	-0.0268	0.0910	0.0181	0.2197	0.0987	-0.0027
Y =13	0.2792	0.0735	-0.0221	0.3228	-0.1359	0.4402	0.3722	-0.3182
Y =14	0.2641	0.3054	0.2539	0.2375	-0.0189	0.2563	0.2997	-0.2333
Y =15	0.1405	0.2761	0.0159	0.2206	0.0006	0.3970	0.3478	-0.4348
Y =16	-0.2091	0.1807	0.1567	0.0934	0.0350	0.2643	0.0945	-0.5496
Y =17	-0.0279	0.3827	0.1578	0.0331	0.1630	0.0882	0.0240	-0.2668
Y =18	0.2872	-0.2265	0.1385	0.1087	0.2135	-0.2017	0.3900	0.2037
Y =19	-0.1373	-0.0909	-0.1113	-0.1159	0.0587	-0.3098	-0.3004	0.3185
Y =20	0.0583	-0.2894	0.0500	-0.1429	0.0134	-0.4832	-0.0975	0.5160
Y =21	-0.1599	-0.0035	-0.1294	0.1170	0.1419	0.2254	-0.0251	-0.2872
Y =22	-0.0361	-0.0875	-0.1644	-0.2856	-0.0037	-0.2886	-0.1934	0.4050
Y =23	-0.1550	-0.1718	-0.0299	-0.0727	-0.0072	-0.0039	-0.2332	-0.1405
Y =24	-0.0037	0.2218	0.1601	-0.0366	-0.0125	0.1116	-0.1304	-0.0415

R. =	9	10	11	12	13	14	15	16
EANS=	14.3068	15.0341	8.9318	25.7727	26.3636	21.2841	38.9091	11.4886
D.S=	3.1019	1.9797	2.1784	1.8261	4.2324	3.5482	3.9302	2.6841

R. =	9	10	11	12	13	14	15	16
Y = 1	-0.1630	0.0623	-0.0655	0.1547	0.2792	0.2641	0.1405	-0.2091
Y = 2	-0.1563	-0.0522	-0.1978	-0.0570	0.0735	0.3054	0.2761	0.1807
Y = 3	-0.4167	-0.0865	-0.2431	-0.0268	-0.0221	0.2539	0.0159	0.1567
Y = 4	-0.3186	-0.0123	-0.2320	0.0910	0.3228	0.2375	0.2206	0.0934
Y = 5	-0.0076	-0.1346	-0.0908	0.0181	-0.1359	-0.0189	0.0006	0.0350
Y = 6	-0.1797	0.1132	-0.3338	0.2197	0.4402	0.2563	0.3970	0.2643
Y = 7	-0.2884	0.0829	-0.1993	0.0987	0.3722	0.2997	0.3478	0.0945
Y = 8	0.2948	0.0101	0.3912	-0.0027	-0.3182	-0.2333	-0.4348	-0.5496
Y = 9	1.0000	-0.1109	0.5782	-0.1181	-0.3625	-0.4911	-0.3901	-0.3565
Y =10	-0.1109	1.0000	-0.0522	0.1248	0.2182	-0.0628	0.0764	-0.0545
Y =11	0.5782	-0.0522	1.0000	-0.0239	-0.3856	-0.4121	-0.4480	-0.5054
Y =12	-0.1181	0.1248	-0.0239	1.0000	0.2886	0.1503	0.1096	0.2522
Y =13	-0.3625	0.2182	-0.3856	0.2886	1.0000	0.4055	0.4925	0.3525
Y =14	-0.4911	-0.0628	-0.4121	0.1503	0.4055	1.0000	0.6212	0.4400
Y =15	-0.3901	0.0764	-0.4480	0.1096	0.4925	0.6212	1.0000	0.4523
Y =16	-0.3565	-0.0545	-0.5054	0.2522	0.3525	0.4400	0.4523	1.0000
Y =17	-0.1077	-0.2178	-0.1473	-0.1356	-0.0832	0.4524	0.2321	0.2527
Y =18	-0.1812	0.1287	-0.0855	-0.0018	0.1744	0.0611	-0.0203	-0.1103
Y =19	0.2678	-0.0200	0.2296	-0.0804	-0.3572	-0.4490	-0.4883	-0.3488
Y =20	0.1625	-0.1346	0.4171	-0.0950	-0.4037	-0.3729	-0.5638	-0.4234
Y =21	-0.0574	0.2120	-0.0624	0.1062	0.0883	0.0392	0.0530	0.1794
Y =22	0.3634	-0.0557	0.3408	-0.0794	-0.3867	-0.2660	-0.3186	-0.2839
Y =23	-0.1251	-0.0872	-0.0198	-0.0155	-0.0614	-0.0809	-0.0770	-0.0122
Y =24	-0.0003	-0.0919	0.0140	0.3064	0.1015	0.1060	0.0523	0.1097

AR. =	17	18	19	20	21	22	23	24
EANS=	11.2386	19.5227	15.4659	7.1364	19.2727	5.3409	2.1477	2.6705
D.S=	3.3132	5.2375	4.6976	4.5382	2.9570	2.6794	0.8194	1.1253

AR. =	17	18	19	20	21	22	23	24
XY = 1	-0.0279	0.2872	-0.1373	0.0583	-0.1599	-0.0361	-0.1550	-0.0037
XY = 2	0.3827	-0.2265	-0.0909	-0.2894	-0.0035	-0.0875	-0.1718	0.2218
XY = 3	0.1578	0.1385	-0.1113	0.0500	-0.1294	-0.1644	-0.0299	0.1601
XY = 4	0.0331	0.1087	-0.1159	-0.1429	0.1170	-0.2856	-0.0727	-0.0366
XY = 5	0.1630	0.2135	0.0587	0.0134	0.1419	-0.0037	-0.0072	-0.0125
XY = 6	0.0882	-0.2017	-0.3098	-0.4832	0.2254	-0.2886	-0.0039	0.1116
XY = 7	0.0240	0.3900	-0.3004	-0.0975	-0.0251	-0.1934	-0.2332	-0.1304
XY = 8	-0.2668	0.2037	0.3185	0.5160	-0.2872	0.4050	-0.1405	-0.0415
XY = 9	-0.1077	-0.1812	0.2678	0.1625	-0.0574	0.3634	-0.1251	-0.0003
XY =10	-0.2178	0.1287	-0.0200	-0.1346	0.2120	-0.0557	-0.0872	-0.0919
XY =11	-0.1473	-0.0855	0.2296	0.4171	-0.0624	0.3408	-0.0198	0.0140
XY =12	-0.1356	-0.0018	-0.0804	-0.0950	0.1062	-0.0794	-0.0155	0.3064
XY =13	-0.0832	0.1744	-0.3572	-0.4037	0.0883	-0.3867	-0.0614	0.1015
XY =14	0.4524	0.0611	-0.4490	-0.3729	0.0392	-0.2660	-0.0809	0.1060
XY =15	0.2321	-0.0203	-0.4883	-0.5638	0.0530	-0.3186	-0.0770	0.0523
XY =16	0.2527	-0.1103	-0.3488	-0.4234	0.1794	-0.2839	-0.0122	0.1097
XY =17	1.0000	-0.0995	-0.3547	-0.2758	0.0537	-0.1141	-0.1595	0.0424
XY =18	-0.0995	1.0000	-0.0593	0.1863	-0.1273	0.0197	-0.1133	-0.2060
XY =19	-0.3547	-0.0593	1.0000	0.4640	-0.1924	0.4225	0.1327	-0.0204
XY =20	-0.2758	0.1863	0.4640	1.0000	-0.1400	0.4541	0.0557	0.0889
XY =21	0.0537	-0.1273	-0.1924	-0.1400	1.0000	-0.0777	0.0959	0.2148
XY =22	-0.1141	0.0197	0.4225	0.4541	-0.0777	1.0000	0.0495	0.1315
XY =23	-0.1595	-0.1133	0.1327	0.0557	0.0959	0.0495	1.0000	-0.0828
XY =24	0.0424	-0.2060	-0.0204	0.0889	0.2148	0.1315	-0.0828	1.0000